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REVISION OF THE GENUS CAELOSPERMUM BLUME (RUBIACEAE, RUBIOIDEAE, MORINDEAE)

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SUMMARY

The genus *Caelospermum* Blume is revised, and a key to the 7 species recognized is presented. *Caelospermum* consists of lianas and, sometimes, shrubs. The genus is distributed in SE. Asia, Indonesia, the Philippines, the Caroline Islands, Papua New Guinea, the Solomon Islands, E. Australia and New Caledonia. *Caelospermum* is closely related to *Morinda, Pogonolobus* and *Gynochthodes*, from which it differs by inflorescence and pollen morphology, etc. *Caelospermum paniculatum* F. Muell. var. *syncarpum* J.T. Johansson is described and two recombinations, *C. volubile* (Merr.) J.T. Johansson and *C. salomoniense* (Engl.) J.T. Johansson, are made. All species are illustrated with line drawings, and distribution maps are provided.

INTRODUCTION

The genus *Caelospermum* was described by Blume (1826–1827), who recognized a single species, *C. scandens*. A few years previously Wallich had described *Webera truncata* (in Roxburgh, 1824) (now *Caelospermum truncatum*), which was subsequently transferred by various authors to several different genera (Candolle, 1830; Wallich, 1847; Miquel, 1857; Hooker, 1873). It became the type species of *Trisciadia* J.D. Hooker (1873). From 1830 till 1930 seven additional species, treated as *Caelospermum*, were described from SE. Asia, China and the Philippines, viz. *C. corymbosum* DC., *C. ahernianum* Elmer, *C. biovulatum* Ridley, *C. morindiforme* Pitard, *C. acuminatum* Geddes, *C. luteum* Geddes, and *C. kanehirae* Merr., all except *C. ahernianum* being now treated as synonyms of *C. truncatum*.

Three species were described from Australia, viz. *Caelospermum paniculatum* F. Muell. (Mueller, 1865–1866), *C. reticulatum* (F. Muell.) Bentham (1867) and *C. decipiens* Baillon (1879c). Of these, *C. reticulatum* has now been retransferred to *Pogonolobus* (Johansson, 1987a), in which genus it was originally described (Mueller, 1858–1859), and *C. decipiens* is here, although provisionally, included in *Morinda* as *M. reticulata* Bentham.

The botanical exploration of New Caledonia was begun at the end of the 18th century (Labillardière, 1825) and during the 19th century important collections were built up by Balansa, Deplanche, Pancher, Schlechter, Vieillard and others. *Styloco-*

rina corymbosa was described by Labillardière (1825) and later became the type species of a new genus, *Olostyla* (Candolle, 1830). Baillon made a detailed study of the New Caledonian material that was brought to Paris and described *C. balansanum*. The study of the flora of New Caledonia has been intensified during the 20th century, and Guillaumin published a series of floristic and taxonomic surveys of the island (e.g. Guillaumin, 1911, 1929, 1944, 1948, 1959). He described *C. monticolum* and also recombined *Figuierea fragrans* Montrouz. and *Olostyla nigrescens* K. Krause under *Caelospermum*.

According to Blume (1826–1827) *Caelospermum* was closely related to *Morinda* and *Gynochthodes*, and this opinion was also held by most subsequent authors. However, Candolle (1830) placed *Caelospermum* in Guettardeae, whereas he included *Olostyla* in Hamelieae. Miquel (1857), on the other hand, treated *Caelospermum* under the subtribe Chasalieae (tribe Psychotrieae). *Olostyla* and *Trisciadia* were placed in Mussaendeae by Hooker (1873), who included *Caelospermum* in Morindeae. According to Schumann (1891), *Olostyla, Pogonolobus* and *Trisciadia* were congeneric with *Caelospermum,* which according to him belonged to Morindeae.

I have retained 4 out of 19 species that have been recognized as *Caelospermum* in the past. *Caelospermum crassifolium* was recently described by Johansson (1987b). One new variety is described here and two species of *Morinda* are recombined under *Caelospermum*. All the species are distinguished on the following combination of characters: branches terete; stipules sheathing; inflorescences puberulous; corolla white with both long and short hairs inside the tube; anthers exserted; pollen grains with large lumina, provided with numerous processes; ovary with biovular locules, and ovules inserted at the middle of the septum; and seeds shortly winged at one end. The distribution extends from Hainan, SE. Asia, the Philippines, Indonesia and Papua New Guinea to S. Micronesia, the Solomon Islands, E. Australia and New Caledonia.

MATERIALS AND METHODS

The revision is based on herbarium material comprising 437 collections, and on my own field observations. Flowers and fruits of *Caelospermum balansanum, C. crassifolium* and *C. monticolum* were collected in the field and preserved in 70% ethanol. Material from the following Herbaria was investigated (abbreviations according to Holmgren et al., 1981): A, AAU, ABD, BISH, BK, BKF, BM, BRI, C, CANB, F, FI, G, GH, K, KEP, L, LAE, MEL, MO, NSW, NY, P, PNH, S, SAR, SING, UC, US, and Z. The following Herbaria were visited: BISH, BK, BKF, BRI, C, K, KEP, L, LAE, P, S, SAR, and SING.

The terminology is according to Jackson (1971), Stearn (1973) and, for pollen morphology, Erdtman (1970).

MORPHOLOGY

Stem and branches. — Six of the species are forest lianas, climbing by means of the orthotropic main shoot up tree trunks and along branches sometimes to a height of 20 metres or more. Only *Caelospermum crassifolium* is usually a shrub a few

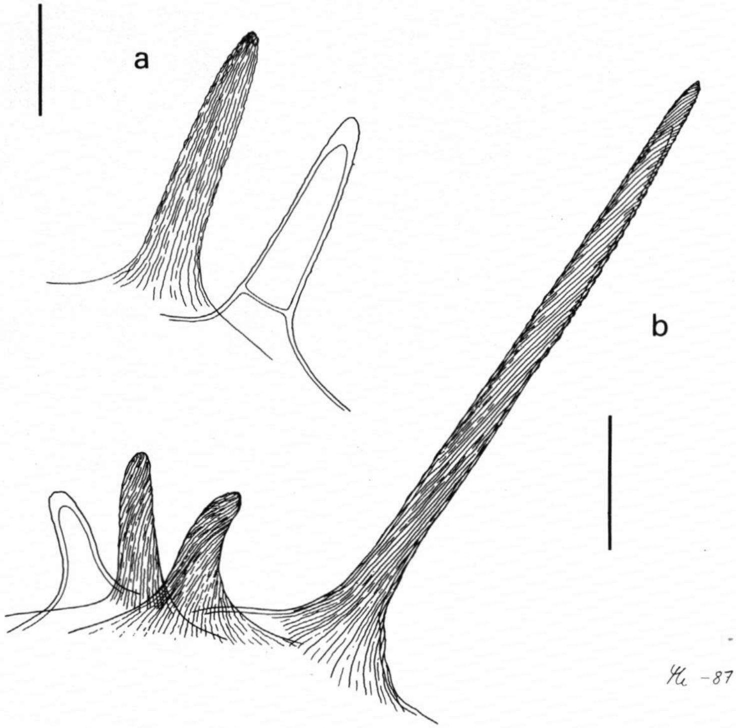


Fig. 1. Hair types in *Caelospermum*. – a. Hairs from abaxial side of stipule; scale 30 µm; b. hairs from inside of corolla tube; scale 0.3 mm.

metres tall, but even in this species the main stem may occasionally elongate and the plant assumes a climbing habit. Plagiotropic shoots often emanate from the leaf axils. When an inflorescence terminates a main branch growth is continued by axillary shoots.

Stipules. — The stipules are fairly short, sometimes exceeding 4 mm in length; they are shortly dentate or almost truncate, and are fused to form a sheath around the internode. They gradually become lignified and are long persistent.

Leaves. — The leaves are usually opposite. In *Caelospermum truncatum* and *C. monticolum* the leaves are sometimes verticillate, three together at each node, and are always so in *C. volubile*.

The epidermis has been investigated in all species. The anticlinal walls of the unspecialized epidermal cells are straight or somewhat curved. In *C. crassifolium* the cell walls are thickened, but in most of the species the walls are fairly thin. The cuticle is normally smooth, but in *C. crassifolium* is covered with dense narrow anastomosing striae running roughly parallel and emanating from some of the stomata. The paracytic stomata have two subsidiary cells and range in length from 15–20 µm as in *C. truncatum* to 35–50 µm as in *C. crassifolium*.

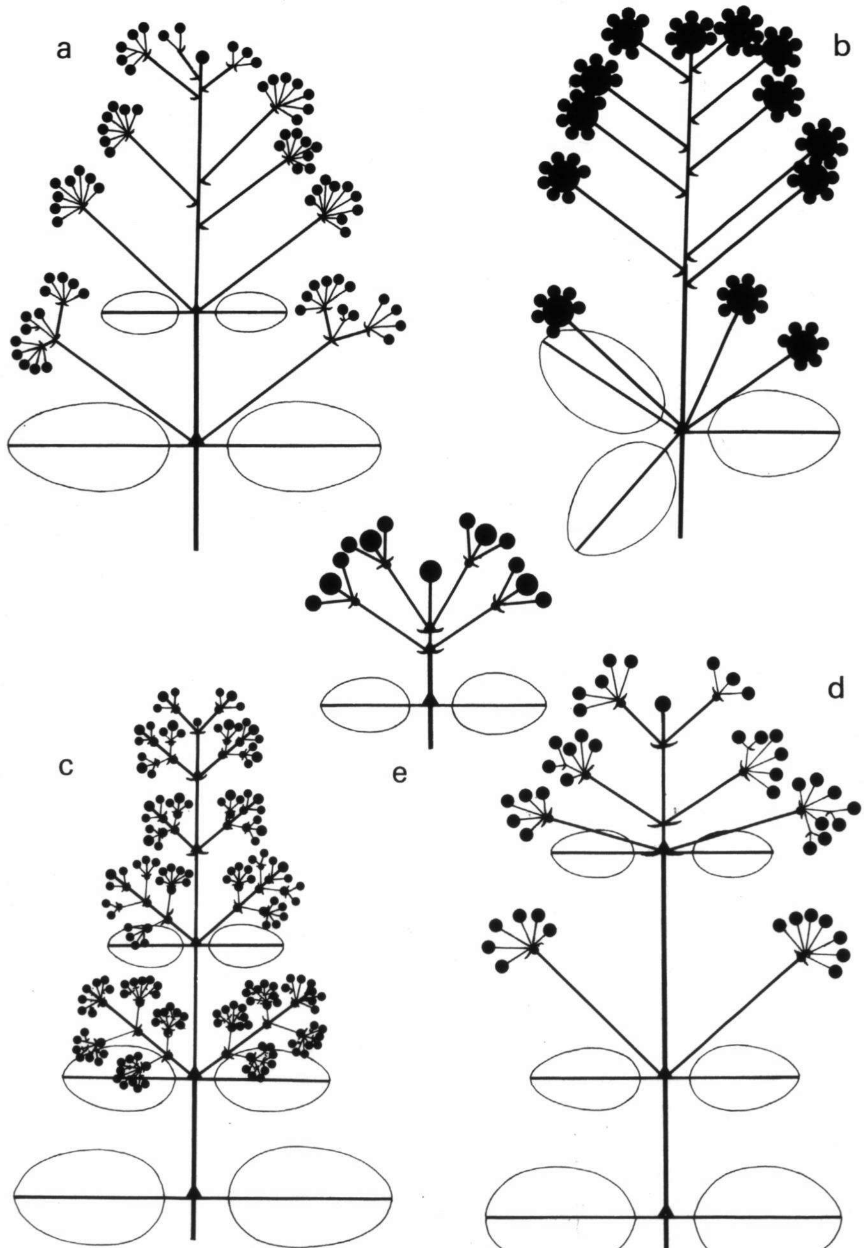


Fig. 2. Inflorescences of *Caelospermum*. – a. *C. truncatum*. – b. *C. volubile* (inflorescence of *C. salomoniense* of similar type but leaves and branches opposite). – c. *C. paniculatum*. – d. *C. balansanum*. – e. *C. monticolum* and *C. crassifolium*.

Domatia occur on the abaxial side of the leaves, in the axils of secondary veins, in all species except *C. crassifolium.* The inside of the domatia is usually covered with smooth unicellular papillary hairs.

Colleters. — Colleters are abundant on the lower part of the adaxial side of the stipules and small bracts, and often along the margin of the bracts, one or two rows also occurring basally on the inner side of the calyx tube in all species except *Caelospermum monticolum.* They are of a type that is common in the Rubiaceae (Lersten, 1974a, 1974b, 1975), being composed of rounded to elongate axial cells and epidermal cells. The colleters inside stipules and bracts are mainly elongate and fingerlike, those in the calyx tube rounded and cushion-shaped, 0.05–0.1 mm in diameter.

Pubescence. — The hairs (fig. 1) are all uniseriate and most are unicellular. The main axis and the branches of the inflorescence as well as the bracts, bracteoles, pedicels, ovaries and calyces are covered with uni- or bicellular hairs, 10–20 µm in diameter and of varying length, with a densely granular surface, the granules forming a striate pattern. On the inside of the corolla tube, and on the basal part of the corolla lobes and filaments, two main types of hairs are commonly seen (fig. 1b): the inside of the tube is covered with papillary, simple or sometimes furcate, usually unicellular hairs, up to 0.1 mm long and 15–25 µm in diameter; in the upper part of the corolla tube and in the throat abundant hairs up to several millimetres long and 15–35 µm in diameter occur. The surface of both hair types is striate, the striae forming a rough spiral.

Inflorescence. — The inflorescences (fig. 2) are panicles or corymbs and terminate both the main shoot and the axillary branches. They vary considerably between the species and are of taxonomic importance. Their components are basically dichasia, but are very often monochasial or modified to umbel-like clusters, presumably by suppression and elimination of internodes. Sometimes the pedicels are eliminated, the partial inflorescence then being capitate. Fusion of inflorescence branches and pedicels, partially or completely, is common in *Caelospermum truncatum, C. volubile* and *C. salomoniense.* In *C. volubile* and *C. salomoniense,* rarely in other species, several to many ovaries fuse to form a syncarp.

An acute triangular bracteole is inserted on the pedicel, usually immediately below the ovary or on the upper part of the pedicel. Small acuminate triangular bracts subtend the pedicels and the upper inflorescence branches. In species with panicles the lower branches are often subtended by small leaflike bracts, and stipules occur at the lower nodes; additional inflorescence branches often emanate from the axils of true leaves at the base of the inflorescence.

In *C. crassifolium* and *C. monticolum* the inflorescences are comparatively few-flowered and composed of regularly branched dichasia (fig. 2e) with a single terminal flower or a dichasium terminating the primary axis. The second uppermost internode (sometimes also the third uppermost internode) is usually suppressed, and two pairs of opposite dichasial branches are situated below the terminal dichasium resulting in a corymbose inflorescence. An additional pair of branches, each bearing one terminal dichasium, often occurs at the node immediately below, the inflorescence then being shortly paniculate.

In the inflorescence of *C. paniculatum* (fig. 2c) the dichasia, which form the partial inflorescences, have very short internodes and pedicels, and are often modified to form umbels or monochasia. The internodes of the secondary axes are shorter than those of the main axis, the inflorescence thus usually being long and narrow.

Calyx. — The campanulate or cupuliform calyx varies markedly in size between and within species. The calyx tube is always erect and the teeth are inconspicuous, rarely exceeding 0.3 mm in length. In *Caelospermum monticolum* the calyx forms a large stiff structure on top of the drupe, whereas in the other species the calyx shrivels as the fruit ripens.

Corolla. — The corolla is uniform in shape throughout the genus, although the size of the lobes is of taxonomic importance. The tube is cylindrical, widening slightly upwards; it is glabrous on the outside and covered with hairs of different sizes on the inside. Narrow longitudinal slits, alternate with the lobes, occur in the lower part of the tube from 1–2 mm above the base to immediately above the middle. This feature has also been observed on fresh material, both in species of *Caelospermum* and in the closely related genus *Morinda.*

The lobes are c. 1–1.5 mm thick, carnose and fairly stiff. The abaxial side is smooth and flat or slightly concave; the adaxial side is provided with three shallow longitudinal furrows corresponding to the veins, and has an apical projection c. 0.5–1 mm long.

The corolla is pure white, later becoming pale brownish-yellow. The duration of anthesis is approximately one day or less, and the corolla is deciduous.

Androecium. — The stamens alternate with the corolla lobes. The filaments are fused with the corolla tube for most of their length up to the throat, but are free along the slits in the tube. The free distal part of the filament is 1.3–7.8 mm long and 0.3–0.4 mm wide. The anthers vary in size and shape and are of some taxonomic significance. In *Caelospermum paniculatum* the anthers are relatively short and usually elliptic or narrowly elliptic in outline, in other species they are longer and usually narrowly oblong.

Pollen. — The pollen morphology in *Caelospermum* has been discussed by Johansson (1987a). They are tricolporate, isopolar, radially symmetrical, oblate or suboblate, rounded-triangular to rounded in polar view and transversely elliptic to transversely broadly elliptic in equatorial view. They vary considerably in size, the polar diameter being 28–51 μm and the equatorial diameter 34–60 μm. The sexine is reticulate, the lumina being up to 10 μm in diameter and the muri c. 1 μm wide, straight or sinuate. Processes of varying length occur in the lumina.

Gynoecium. — The ovary is primarily bilocular. During fruit development the two ovules in each locule gradually become separated by tissue that grows out at right angles from the primary septum forming a secondary septum running along the length of the ovule, and subsequently becoming as thick as the primary septum.

Style and stigma vary considerably in length and shape, and there is a tendency towards heterostyly in the genus. Thus, there are two main morphological types of pistils in all the species, although intermediate types are common. In the first type the style is relatively long, the stigma protrudes outside the corolla tube, and the lobes are reflexed. In the second type the style is shorter, the stigma being included in the

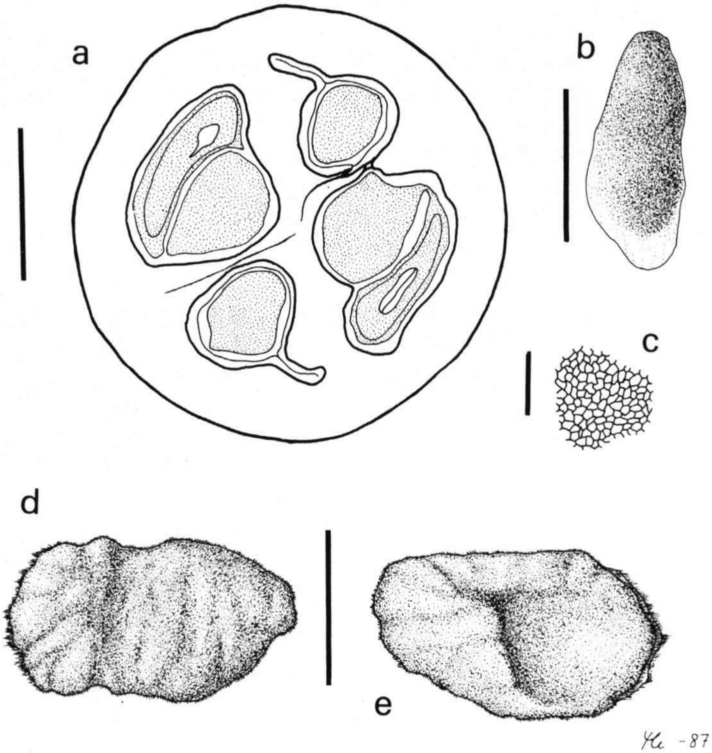


Fig. 3. – a. Drupe in cross section (*Caelospermum crassifolium, Johansson 85*). – b. Seed in lateral view (*C. paniculatum* var. *paniculatum, Bäuerlen 766*); note the pale basal narrow winglike structure. – c. Testa cells (*C. volubile, Sulit PNH 8233*). – d & e. Pyrene in lateral view; basal end to the left (d) and to the right (e) (*C. salomoniense, Hartley TGH 12287*). – Scales: a, b, d & e 5 mm; c 0.5 mm.

corolla tube, and the lobes are erect or almost so. I have not found that these two morphological types are correlated with other features and, since intermediates are common, I have refrained from distinguishing different floral morphs in the descriptions of the species.

Fruit. — The fruit is a drupe that is sometimes modified by the fusion of several to many ovaries to form a syncarp. The mesocarp is carnose and relatively thin. The endocarp is cartilagineous and c. 0.5 mm thick; it is concavo-convex to planoconvex, pale brown, and densely puberulous; the basal part is more or less open with a narrow slit along the end (fig. 3).

Seed. — The seeds (fig. 3) are approximately 1 cm long and 0.5 cm wide, flattened, elliptic or ovate with the lower part slightly broader than the upper part. They have a thin, winglike structure at the basal end extending half-way along the edges. The testa cells are isodiametric or almost so.

TAXONOMIC POSITION

Caelospermum is placed in the tribe Morindeae (subfamily Rubioideae; see Bremekamp, 1966), the most closely related genera being *Morinda, Pogonolobus* and *Gynochthodes*. Characters common to these genera include: young twigs terete, domatia in the axils of secondary veins on the abaxial side of the leaves, corolla with similar shape and pubescence, and ovary, fruit and seeds of similar type. *Caelospermum* is distinguished from *Morinda* mainly on pollen-morphological characters, the lumina of the sexine being much larger in *Caelospermum* with few or numerous luminal processes. Moreover, the inflorescences differ: in *Morinda* the partial inflorescences are either axillary or concentrated in terminal umbel-like cymes, whereas in *Caelospermum* the compound cymes are panicles or corymbs. *Gynochthodes,* on the other hand, differs from *Caelospermum* in the hairs fringing the stipules, bracts and calyces, the axillary and verticillate inflorescences, the outward-bent calyx tube, and the long hairs on the corolla lobes. In addition the sexine of the pollen grains have numerous small lumina.

Morinda reticulata Bentham was transferred to *Caelospermum* under the name *C. decipiens* by Baillon (1879c), but differs from *Caelospermum* in several distinguishing characters: in *M. reticulata* the stipules have a prolonged apex and are not sheathing; the inflorescence branches are glabrous and the calyx tube lacks colleters on the inside; the corolla lobes are covered with long club-shaped hairs on the adaxial side and the corolla tube lacks narrow longitudinal slits; the anthers are erect and the sexine of the pollen grains have numerous small lumina. I have tentatively included the species in *Morinda,* although *M. reticulata* differs from all other species of this genus.

PHYTOGEOGRAPHY

The distribution of the genus *Caelospermum* is as follows: one species in SE. Asia including SE. China, Sumatra, Java and Borneo; one species in the Philippines; one species in the Moluccas, the Caroline Islands, Papua New Guinea and the Solomon Islands; one species in Australia in E. Queensland and New South Wales; and three endemic species in New Caledonia. They occur both in the lowlands and in the mountains to above 2000 m. Most species are adapted to rain forest conditions, although two species in New Caledonia grow in forest and scrub on ultrabasic soils. Figs. 4–8.

According to their areas of distribution, the species of *Caelospermum* can be placed in some of the floristic regions which were recognized by, for instance, Takhtajan (1969). *Caelospermum truncatum* is distributed in the Indo-Chinese and Malesian Regions, with the exception of the Philippines where *C. volubile* is endemic. Although the Philippines are phytogeographically close to Malaysia and West Indonesia, they are floristically well defined having more than 30 endemic genera (Steenis, 1950). *Caelospermum salomoniense* occurs in the Papuan Region, but is also known from a single locality in the Caroline Islands. Three species belong to the Neocaledonian Region of the Neocaledonian Subkingdom. Finally, *C. paniculatum* occurs within the North and East Australian Region of the Australian Kingdom.

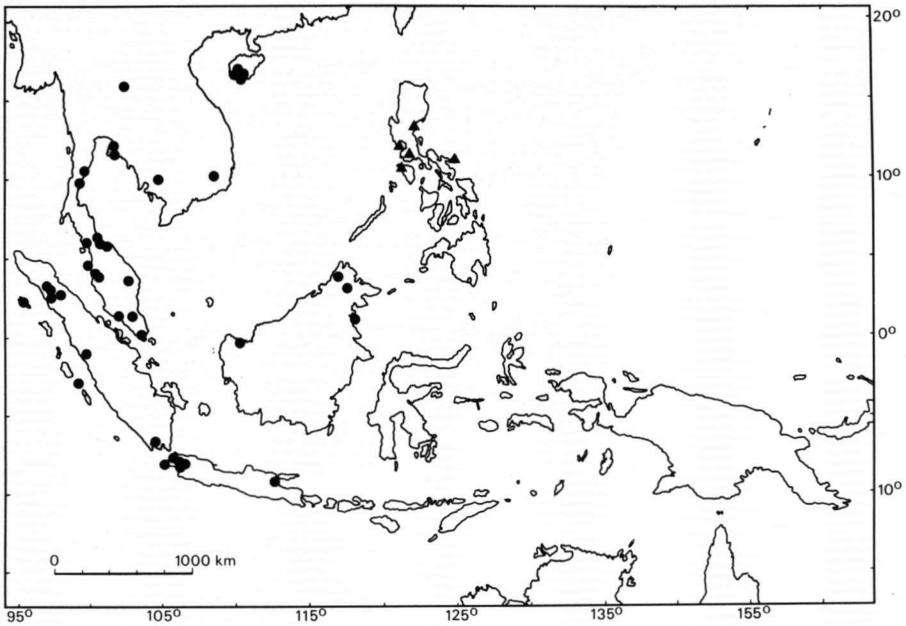


Fig. 4. Collecting sites of *Caelospermum truncatum* (Wall.) Baill. ex K. Schum. (dots) and *C. volubile* (Merr.) J.T. Johansson (triangles).

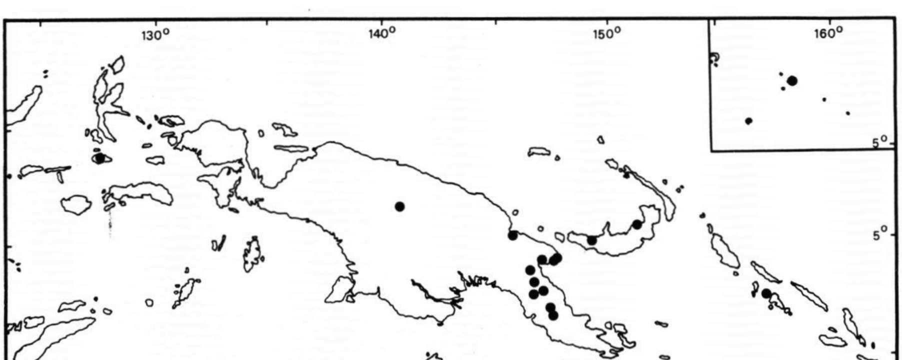


Fig. 5. Collecting sites of *Caelospermum salomoniense* (Engl.) J.T. Johansson.

Takhtajan (1969, 1986) includes both the Neocaledonian and Indo-Malesian Subkingdoms in the Paleotropical Kingdom (Paleotropis). According to Morat et al. (1986) New Caledonia has its closest floristic affinities with Australia. Among the genera confined to New Caledonia and Australia are *Argophyllum, Duboisia, Medicosma, Niemeyera* and *Virotia* (Morat et al., l.c.). Moreover, most of the species of many of the genera that occur in New Caledonia, e.g. *Hibbertia* and *Styphelia*, are endemic to Australia. It may be more convenient to connect New Caledonia phy-

togeographically with northeastern and eastern parts of Australia rather than with Southeast Asia, Malesia, and Polynesia. The distinctive character of the flora of New Caledonia has been pointed out many times (see, e.g., Balgooy, 1960).

Of the three species of the genus *Caelospermum* endemic to New Caledonia, *C. crassifolium* and *C. monticolum* are restricted to ultrabasic soils, *C. balansanum* avoiding this type of substrate. *Caelospermum crassifolium* is common in the southern third of the island and *C. monticolum* is known only from the northwest.

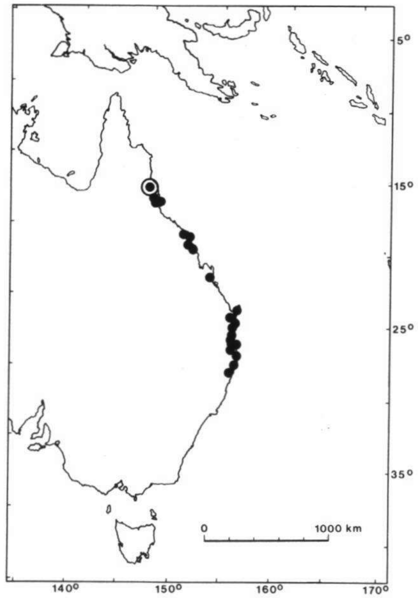


Fig. 6. Collecting sites of *Caelospermum paniculatum* F. Muell.: var. *paniculatum* (dots); var. *syncarpum* J.T. Johansson (encircled dot).

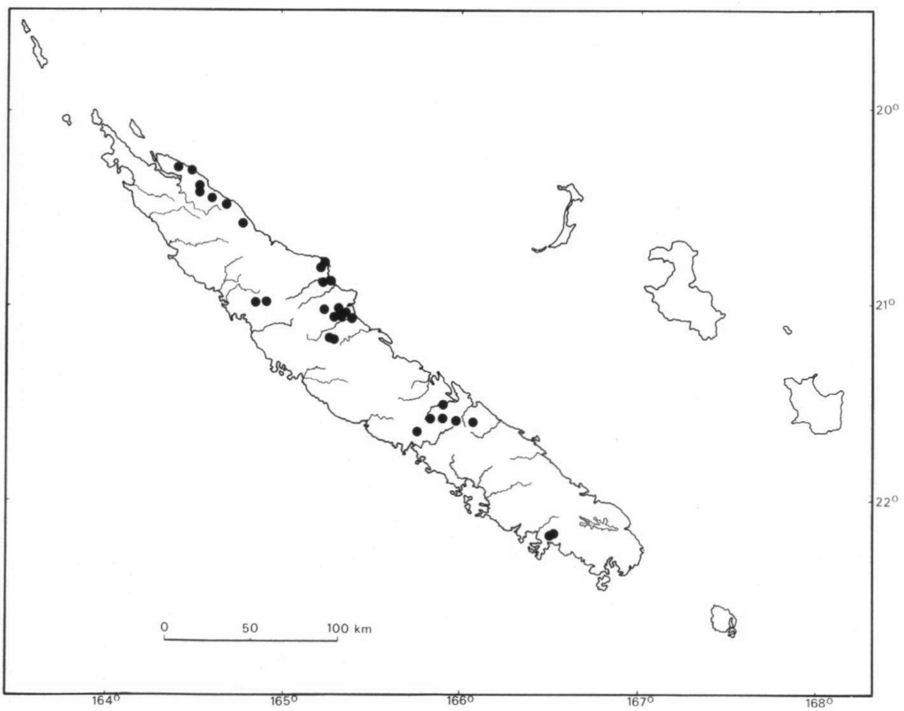


Fig. 7. Collecting sites of *Caelospermum balansanum* Baill.

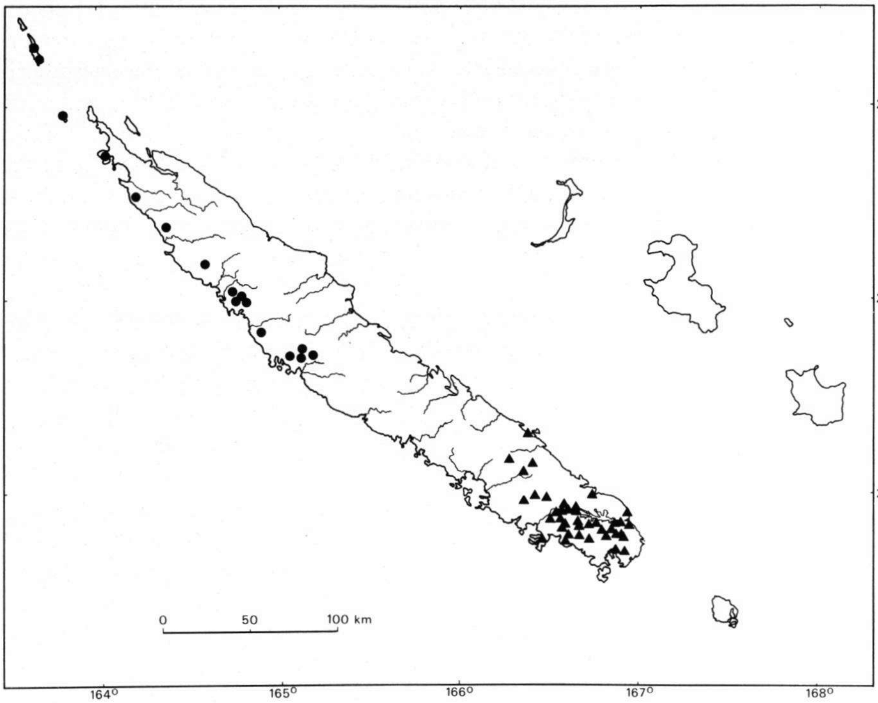


Fig. 8. Collecting sites of *Caelospermum monticolum* Baill. ex Guillaumin (dots) and *C. crassifolium* J.T. Johansson (triangles).

CAELOSPERMUM

Caelospermum Blume (1826–1827) 994; Backer & Bakhuizen van den Brink Jr (1965) 348. — *Coelospermum* Candolle (1830) 468; Richard (1834) 209; Don (1834) 558; Endlicher (1838) 543; Dietrich (1839) 497; Korthals (1851) 230; Miquel (1857) 301, 356; Bentham (1867) 424; Miquel (1869) 244; Hooker (1873) 23, 119; Baillon (1880) 415; Hooker (1880) 159; Schumann (1891) 136; Boerlage (1891) 137; Bailey (1900) 769; King & Gamble (1904) 50; Ridley (1923) 120; Pitard (1924) 430; Guillaumin (1929) 41. — *Trisciadia* Hooker (1873) 68; Baillon (1879b) 195; Hooker (1880) 94. — Type: *Caelospermum scandens* Blume = *Caelospermum truncatum* (Wall.) Baill. ex K. Schum.

Olostyla Candolle (1830) 440; Don (1834) 540; Baillon (1879a) 183; Baillon (1879b) 195; Schlechter (1906) 265. — *Holostyla* Endlicher (1838) 546. — Type: *Olostyla corymbosa* (Labill.) DC. = *Caelospermum balansanum* Baill.

Merismostigma Moore (1921) 332. — Type: *Merismostigma neocaledonicum* S. Moore = *Caelospermum balansanum* Baill.

Lianas or sometimes shrubs. Young branches terete, smooth, puberulous on distal parts, green; bark on old branches rugose, glabrous, light grey to light yellowish-greyor brownish-grey to brown; xylem slightly lobed, white to pale brownish-white.

Raphides abundant. *Stipules* interpetiolar, persistent, truncate or acuminate, puberulous, connate and sheathing at the internode; adaxial side of stipules bearing numerous colleters near base. *Leaves* decussate on vertical branches, distichous on horizontal branches, opposite or sometimes 3-verticillate, dorsiventral, petiolate, entire, glabrous, chartaceous or coriaceous, dark glossy green or sometimes yellowish-green on adaxial side, paler green on abaxial side; base narrowly or broadly cuneate or sometimes truncate; apex acute to acuminate or obtuse or sometimes retuse or emarginate; venation brochidodromous; stomata paracytic; domatia present in axils of secondary veins on abaxial side or absent; bacterial nodules not seen. *Inflorescences* terminal or axillary, a panicle or corymb; lower inflorescence bracts often leaflike; upper bracts 0.5–2 mm long, triangular or narrowly triangular, acute, densely puberulous, with colleters on adaxial side and often along margin; pedicels and inflorescence branches densely puberulous; pedicels terete, simple or partially or completely connate, or absent. *Flowers* 4–6-merous, hermaphrodite, sessile or pedicellate, strongly fragrant; calyx including ovary campanulate or cupuliform, densely puberulous; calyx tube truncate or denticulate, usually with colleters inside at base; calyx teeth minute, triangular, acute or obtuse; aestivation valvate; corolla hypocrateriform, carnose, white, becoming yellowish- to brownish-white; inner side of tube covered with papillary hairs and in upper part long striate hairs; lower part of tube with narrow longitudinal slits alternating with lobes; corolla lobes narrowly oblong or narrowly obovate, obtuse, papillose at margins, with long striate hairs at base of adaxial side and with a distal adaxial projection. *Stamens* 4–6; filaments inserted in throat of corolla tube, linear, with long striate hairs at base, white; anthers elliptic, narrowly elliptic or narrowly oblong, exserted, slightly recurved, dorsifixed below middle, versatile, introrse, dehiscing along their whole length by longitudinal slits, glabrous, yellow becoming brown; style terete, glabrous, white; stigma bilobate, included in the tube or exserted; lobes narrowly oblong, obtuse, erect or recurved, minutely papillose on inner surfaces and along margins, white. *Ovaries* simple or 2–20(–30)-connate, inferior, primarily bilocular with biovular locules, later with two longitudinal secondary septa; funicle slender, inserted at middle of septum; ovules anatropous, apotropous, ascending. *Fruit* a drupe, globose or obovoid, glossy, with 1–4 pyrenes, or sometimes a syncarp composed of 2–20 ovaries; mesocarp carnose; endocarp obovoid, concavo-convex to planoconvex, cartilaginous, pale brown, densely puberulous, with a narrow slit in the lower part. *Seed* flattened, ovate or elliptic, with a narrow wing at the basal end and along edges; testa brown to reddish-brown or purplish; endosperm corneous, white. *Embryo* central; hypocotyl elongate; cotyledons ovate or elliptic.

KEY TO THE SPECIES

1a. Nodes of inflorescence not swollen 2
b. Nodes of inflorescence swollen. 4
2a. Ovaries simple; fruit a drupe . . . . **1. C. truncatum**
b. Ovaries (2–)5–20-connate; fruit a syncarp. 3

3a. Leaves opposite, 2 at each node; corolla lobes 9–11 mm long **2. C. salomoniense**
b. Leaves verticillate, 3 at each node; corolla lobes 6–8 mm long **3. C. volubile**
4a. Calyx tube at least 2.4 mm long, usually longer; colleters lacking on inside of calyx tube . . . . **6. C. monticolum**
b. Calyx tube not exceeding 1.9 mm in length, usually shorter; colleters abundant on inside of calyx tube 5
5a. Corolla lobes 5–7.5 mm long; anthers 3–4.7 mm long . . **4. C. paniculatum**
b. Corolla lobes at least 10 mm long; anthers at least 5 mm long, usually longer 6
6a. Inflorescence 20–80-flowered, usually a panicle; domatia present in axils of secondary veins; cuticle of leaves smooth . . . . **5. C. balansanum**
b. Inflorescence (1–)5–20-flowered, usually a corymb; domatia lacking; cuticle of leaves striate . . . . **7. C. crassifolium**

1. Caelospermum truncatum (Wall.) Baill. ex K. Schum. – Fig. 9.

Caelospermum truncatum (Wall.) Baill. ex K. Schumann (1891) 136; King & Gamble (1904) 51; Ridley (1923) 121. — *Webera truncata* Wall. in Roxburgh (1824) 538; Dietrich (1839) 792. — *Cupia truncata* (Wall.) Candolle (1830) 394; Don (1834) 507. — *Stylocoryne truncata* (Wall.) Wallich (1847) no. 8403 — *Pseudixora truncata* (Wall.) Miquel (1857) 210. — *Trisciadia truncata* (Wall.) Hooker (1880) 94. — Type: *Wallich s.n.*, Peninsular Malaysia, Pinang, Aug. 1822 (K-W 8403, lecto, selected here; K).

Caelospermum scandens Blume (1826–1827) 994; Candolle (1830) 468; Don (1834) 558; Dietrich (1839) 497; Korthals (1851) 230; Miquel (1857) 301; Miquel (1869) 244; Hooker (1880) 159; Schumann (1891) 136; Boerlage (1891) 137; King & Gamble (1904) 51; Brandis (1906) 393; Merrill (1921) 581; Ridley (1923) 121; Craib (1934) 186; Hochreutiner (1934) 282; Backer & Bakhuizen van den Brink Jr (1965) 348. — Type: *Blume s.n.*, Java, Nusa Kambangan (L, lecto, selected here).

Caelospermum corymbosum Blume ex Candolle (1830) 468; Don (1834) 558; Dietrich (1839) 497; Miquel (1857) 301; non *Caelospermum corymbosum* (Labill.) Baill. ex K. Schumann (1891) 136. — Type: *Blume s.n.*, Java (G-DC, lecto, selected here).

Caelospermum biovulatum C.B. Clarke ex Ridley (1918) 87; Ridley (1923) 121. — Type: *Maingay 3053*, Peninsular Malaysia, Malacca, 31 Oct. 1867 (K, lecto, selected here).

Caelospermum morindiforme Pierre ex Pitard (1924) 432. — *Trisciadia morindiformis* Pierre ex Pitard (1924) 432, pro syn. — Type: *Pierre 634*, Cambodia, Kompong Speu Prov., Mt Knang Repoeu, May 1870 (P, lecto, selected here; P, Z).

Caelospermum acuminatum Geddes in Geddes & Craib (1928) 244; Craib (1934) 185. — Type: *Kerr 8736*, Thailand, Northeastern Prov., Loei Dist., Phu Krading, 1200 m, 13 March 1924 (K, lecto, selected here; ABD, BK, BM).

Caelospermum luteum Geddes in Geddes & Craib (1928) 245; Craib (1934) 186. — Type: *Kerr 4150*, Thailand, Southeastern Prov., Chon Buri Dist., Si Racha, Ban Dan, 70 m, 4 April 1920 (K, lecto, selected here; ABD, BM).

Caelospermum kanehirae Merrill (1930) 288; Merrill & Chun (1930) 80. — Type: *Katsumada 21957*, China, Guangdong Prov., Hainan, June 1908 (UC, lecto, selected here).

Liana, up to 15 m. Stipules 1–4.3 mm long. *Leaves* 2 or sometimes 3 at each node; petiole 3–35 mm long; lamina 4.5–18 × 2–9.5 cm, narrowly to broadly obovate or narrowly to broadly elliptic or narrowly to broadly ovate, chartaceous or



Fig. 9. *Caelospermum truncatum* (Wall.) Baill. ex K. Schum. Inflorescence; scale 20 mm (*Liang 61672*).

slightly coriaceous, dark green on adaxial side, paler green on abaxial side; base narrowly to broadly cuneate; margin not reflexed; apex usually acute or acuminate with acumen up to 15 mm long, sometimes obtuse; pairs of secondary veins 5–9(–10); domatia present in axils of secondary veins; cuticle not striate. *Inflorescence* usually a panicle, sometimes a corymb, 1.5–32 cm long, with c. 20–200 flowers; partial inflorescences (2–)7–26, usually umbel-like, each with 1–20 flowers; nodes of

branches not swollen; lowermost inflorescence branches 1–10 cm long; lower inflorescence branches 3- or 4-verticillate, opposite or alternate; upper inflorescence branches opposite or alternate; branches often fused basally with the main inflorescence axis; pedicels simple, 0.5–9(–11) mm long and 0.7–1 mm in diam. in flower, up to 21 mm long and 2.5 mm in diam. in fruit; calyx tube 0.6–2.2 mm long, 2.1–3.8 mm in diam.; colleters abundant along base of adaxial side; calyx teeth up to 0.4 mm long; corolla tube 4–9(–11) mm long, 1.5–1.8(–2) mm in diam.; corolla lobes 4.5–8.5(–12) mm long, 1.6–2.3(–3.5) mm wide; filaments (1.3–)1.8–5.5 (–6.5) mm long; anthers 3.7–6(–7.5) mm long; pollen grains: P = 28–40 µm; E = 37–46 µm; ovaries simple; style 3.7–13 mm long; stigma 2–4.2(–5.3) mm long. *Fruit* a drupe, 20–27 mm in diam., globose to subglobose, dark purple.

Distribution. SE. China, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo. Fig. 4.

Ecology. Virgin and secondary lowland and montane rain forest, thickets and other types of scrubland from near sea-level to 1900 m. Flowering the whole year.

Notes. *Caelospermum truncatum* varies extensively in the size of the calyx. In a few collections from Sabah (*Carr 26459, 26795* and *27046, Cockburn SAN 83119*) the calyx is broader (up to 3.8 mm in diam.) and in some of the flowers in these specimens the corolla lobes and anthers are longer (up to 12 mm and 7.5 mm long respectively) than is normal in the species. Collections from Lampung Prov. (*Jacobs 8150*) and Aceh Prov. (e.g. *de Wilde & de Wilde-Duyfjes 15014* and *15837*), Sumatra, have likewise relatively broad calyces (up to 3.5 mm in diam.). Intermediates occur, however, and I have refrained from giving them formal taxonomic recognition.

Webera truncata was described by Wallich from material he collected on Pulau Pinang, Peninsular Malaysia. I have selected one of the three specimens of the original material at K as lectotype.

The generic affinities of *C. truncatum* were debated during the 19th century. Candolle (1830) included it in the genus *Cupia,* which is congeneric with *Randia,* whereas Wallich (1847) subsequently placed the species in *Stylocoryne* (= *Tarenna*). Miquel (1857) recombined the species into *Pseudixora* (= *Randia*) with some hesitation, as indicated by a question-mark after the generic name. Hooker (1873) even described a new monotypic genus, *Trisciadia,* to accommodate *'T. truncata'*. Finally, Schumann (1891) and King & Gamble (1904) included it in *Caelospermum.*

Caelospermum scandens is the most widely used name for this species. I have selected as lectotype a specimen at L with Blume's handwriting on the sheet.

There is one sheet at L labelled *'Caelospermum corymbosum'* in Blume's handwriting. It is uncertain whether this specimen is a duplicate of the specimen preserved at G-DC, which is here selected as lectotype of *C. corymbosum* DC.

In his description of *Caelospermum kanehirae* Merrill (1930) did not cite a type specimen. However, in the introduction to the paper he clearly stated that the 'actual types are deposited in the herbarium of the University of California', and for this reason I have selected a specimen at UC as lectotype.



Fig. 10. *Caelospermum salomoniense* (Engl.) J. T. Johansson. Inflorescence; scale 20 mm (*Hartley TGH 11094*).

2. Caelospermum salomoniense (Engl.) J.T. Johansson, *comb. nov.* – Fig. 10.

Morinda salomoniensis Engler in Engl. Bot. Jahrb. 7 (1886) 478; Schumann (1887) 222; Schumann & Lauterbach (1901) 589; Valeton (1927) 154; Merrill & Perry (1945) 264. — Original collection: *Naumann s.n.*, Papua New Guinea, Bougainville, 26 Aug. 1875 (B, holo?, destroyed). — Type: *Hartley TGH 11094*, Papua New Guinea, Morobe Dist., S of the Busu River about 12 miles N of Lae, c. 150 m, rain forest, 10 Jan. 1963 (K, neo, selected here; L).
Morinda volubilis auct. non Merr.: Kanehira (1935) 421.

Liana, up to at least 20 m. Stipules 1.8–4.5 mm long. *Leaves* 2 at each node; petiole 3–38 mm long; lamina 3.5–17 × 2–10.5 cm, ovate or broadly ovate or elliptic or broadly elliptic, sometimes obovate, chartaceous or somewhat coriaceous, dark green on adaxial side, paler green on abaxial side; base narrowly or broadly cuneate; margin not reflexed; apex acute or acuminate with acumen up to 10 mm long; pairs of secondary veins 5–8(–11), domatia present in axils of secondary veins; cuticle not striate. *Inflorescence* a panicle or sometimes a corymb, 2–30 cm long, with c. 25 to more than 300 flowers; partial inflorescences (4–)9 to 43, each with (2–)4–20 flowers; nodes of branches not swollen; lowermost inflorescence branches 1–11 cm long; lower inflorescence branches usually opposite, sometimes alternate; upper inflorescence branches alternate; branches often fused basally with the main inflorescence axis; pedicels lacking; peduncles of capitula 0.7–2 mm in diam.; calyx tube 0.9–1.4 mm long, 2.6–3.3 mm in diam.; colleters present along base of adaxial side; calyx teeth up to 0.3 mm long; corolla tube 4–7 mm long, 2–2.5 mm in diam.; corolla lobes 9–11 mm long, 2–2.5 mm wide; filaments 2.8–5.5 mm long; anthers 5.6–7.4 mm long; pollen grains: P = 36–41 µm; E = 36–51 µm; ovaries (2–)4–20-connate; style 4–7.8 mm long; stigma 3.8–5.4(–9.2) mm long. *Fruit* a syncarp, 2–2.5 × 1.5–2 cm, red.

Distribution. The Moluccas, Papua New Guinea, the Solomon Islands, the Caroline Islands. Fig. 5.

Ecology. Lowland and montane rain forest from near sea-level to 2300 m. Flowering specimens have been collected in January, September and November.

Notes. *Caelospermum salomoniense* is related to *C. volubile*, but differs in having opposite leaves, broader calyx, larger corolla lobes and on an average somewhat longer anthers.

Caelospermum salomoniense is here transferred from *Morinda*. Both the type of inflorescence and the pollen morphology closely resemble those in other species of *Caelospermum*. The holotype of *Morinda salomoniensis* Engler, collected by Naumann on Bougainville in 1875, was most probably kept at B, and seems to have been destroyed during World War II. No isotype has been found, and I have instead selected a neotype from a recent well-preserved collection made by Hartley.

3. Caelospermum volubile (Merr.) J.T. Johansson, *comb. nov.* – Fig. 11.

Morinda volubilis Merrill in Philipp. J. Sci. Sect. C (Bot.) 1 (Suppl. 1) (1906) 137; Merrill (1918) 369; Merrill (1923) 574. — Type: *Meyer FB 2290*, Philippines, Bataan Prov., Lamao River, Mt Mariveles, Dec. 1904 (K, lecto, selected here; F, NY).
Morinda tinctoria auct. non Roxb.: Vidal y Soler (1883) 29, pl. LVII, fig. J.



Fig. 11. *Caelospermum volubile* (Merr.) J.T. Johansson. – a. Inflorescence (*Sulit PNH 3412*); b fruits (*Sulit PNH 8233*); scales 20 mm.

Liana, up to 15 m (Merrill, 1906). Stipules 1–3 mm long. *Leaves* 3 at each node; petiole 3–39(–51) mm long; lamina 4.1–16 × 1.8–8 cm, elliptic or broadly elliptic or obovate or ovate or broadly ovate, sometimes broadly obovate, chartaceous, dark green on adaxial side, paler green on abaxial side; base usually narrowly cuneate, sometimes broadly cuneate or truncate; margin not reflexed; apex usually acute or acuminate with acumen up to 15 mm long, sometimes obtuse; pairs of secondary veins (4–)5–8(–9); domatia present in axils of secondary veins; cuticle not striate. *Inflorescence* a panicle or a corymb, 1.5–8.5 cm long, with c. 80 to more than 200 flowers; partial inflorescences 12 to more than 30, capitula, each with (4–)5–12 flowers; nodes of branches not swollen; lowermost inflorescence branches 0.5–4 cm long; lower inflorescence branches usually verticillate, sometimes alternate; upper

inflorescence branches usually alternate; branches often fused basally with the main inflorescence axis; pedicels lacking; peduncles of capitula 1–2 mm in diam.; calyx tube 0.6–1.2 mm long, 1.6–2.1 mm in diam.; colleters abundant along base of adaxial side; calyx teeth up to 0.2 mm long; corolla tube 4–7 mm long, 1–1.5 mm in diam.; corolla lobes 6–8 mm long, 1.2–1.5 mm wide; filaments 2.2–4.2 mm long; anthers 5–6 mm long; pollen grains: P = 34–39 µm; E = 39–48 µm; ovaries (4–) 5–12-connate; style 9–12 mm long; stigma 0.7–4.2 mm long. *Fruit* a syncarp, 14–25 × 11–18 mm, dark red.

Distribution. Luzon, Catanduanes and Mindoro in the Philippines. Fig. 4.

Ecology. Forest to above 100 m. Flowering specimens have been collected in July, August and December.

Notes. *Caelospermum volubile* resembles *C. salomoniense,* but is distinguished on the leaves which are verticillate three together at each node, a feature that occurs only exceptionally in two other species. The lower branches of the inflorescence are verticillate or alternate.

Caelospermum volubile was previously included in *Morinda* (Merrill, 1906). The morphology of inflorescence and pollen grains indicate that the closest relatives of the species are to be found in *Caelospermum.*

According to Merrill (1906), *Morinda volubilis* is identical with *Coffea volubilis* Blanco (1837: 157; 1845: 111; *Morinda tinctoria* Roxb. fide Fernandez-Villar & Naves, 1880: 111). No original material of *Coffea volubilis* is known, and it is not possible to conclude from Blanco's description exactly which species he had in mind. Merrill did not quote any original specimen but merely stated that he was 'fairly confident' that the two were conspecific. Merrill cited two collections when describing *M. volubilis.* I have selected one of the specimens at K as lectotype, since the material in Manila, on which Merrill presumably based his description, may have been destroyed during World War II.

4. Caelospermum paniculatum F. Muell. – Fig. 12.

Caelospermum paniculatum F. Muell. (1865–1866) 19; Bentham (1867) 425; Bailey (1900) 769. — Type: *Dallachy s.n.*, Australia, Queensland, Rockingham's Bay, Oct. 1864 (MEL, lecto, selected here).

Liana, up to at least 10 m. Stipules 1.2–3.5 mm long. *Leaves* 2 at each node; petiole 6–28 mm long; lamina 4.7–15 × 2.7–6.5 cm, usually elliptic or obovate or narrowly obovate, sometimes broadly or narrowly elliptic, or ovate, chartaceous or slightly coriaceous, dark green on adaxial side, paler green on abaxial side; base narrowly cuneate; margin slightly or not reflexed; apex usually acute or acuminate with acumen up to 9 mm long, sometimes obtuse and rounded; pairs of secondary veins (6–)7–10(–11); domatia present in axils of secondary veins; cuticle not striate. *Inflorescence* a panicle, 2–13 cm long, with c. 30–220 flowers; partial inflorescences c. 10–60, dichasia or umbel-like, rarely capitula of several flowers with connate ovaries, each with 2–6(–11) flowers; nodes of branches swollen; lowermost inflorescence branches 0.4–2(–8) cm long; branches opposite; pedicels simple or rarely lacking, 0–3(–4) mm long and 0.7–0.9 mm in diam. in flower, up to 1.5 mm in

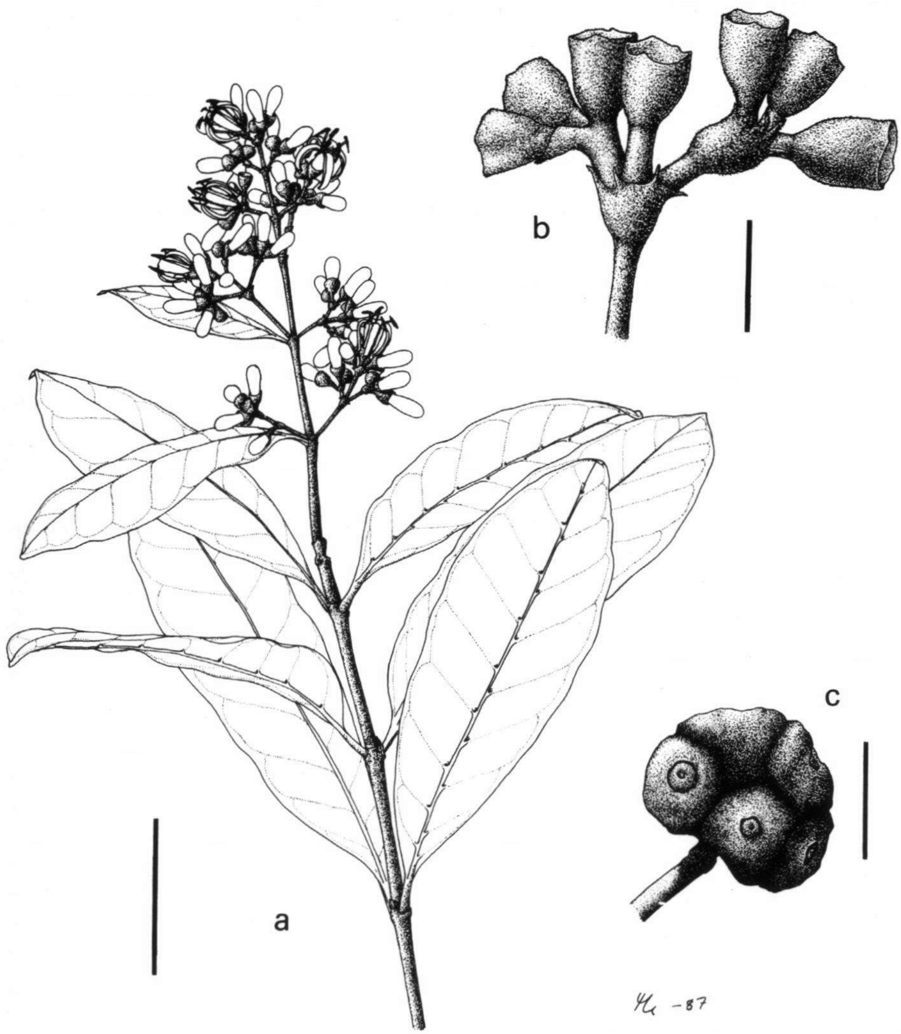


Fig. 12. *Caelospermum paniculatum* F. Muell. – a & b. var. *paniculatum* (*Sharpe 2471*): a. inflorescence; scale 20 mm; b. partial inflorescence; scale 2 mm. – c. var. *syncarpum* J.T. Johansson (*Moriarty 2048*), fruit; scale 10 mm.

diam. in fruit; calyx tube 0.8–1.5 mm long, 2.1–2.8 mm in diam.; colleters abundant along base of adaxial side; calyx teeth up to 0.2 mm long; corolla tube 3–6 mm long, 1.8–2 mm in diam.; corolla lobes 5–7.5 mm long, 1.5–2.2 mm wide; filaments 2.2–4 mm long; anthers 3–4.7 mm long; pollen grains: P = 30–35 µm; E = 34–46 µm; ovaries simple or rarely connate; style 2.2–7.5 mm long; stigma 1.8–5.5 mm long. *Fruit* a drupe or rarely a syncarp, 11–20 mm in diam., globose, red to purplish.

a. var. paniculatum – Fig. 12a, b.

Ovaries simple. Fruit a drupe.

b. var. syncarpum J.T. Johansson, *var. nov.* – Fig. 12c.

Ovaria 3–30-connata; fructus syncarpi. — T y p u s : *Hyland 5700,* Australia, Queensland, Danbulla between Kauri and Robson Creeks, 680 m, 23 Nov. 1971 (BRI, holo; K, L).

Ovaries connate 3–30 together. Fruit a syncarp, 1–3 × 1–2 cm.

D i s t r i b u t i o n. Australia, E. coast of Queensland and New South Wales. Fig. 6.

E c o l o g y. Rain forest, mixed notophyll forest, scrubland, on different soil types, often near the beach, from near sea-level to at least 700 m. Flowering specimens have been collected from October to December.

N o t e s. *Caelospermum paniculatum* is characterized by the short anthers and the narrow elongate inflorescences made up of dichasia with usually very short pedicels. Often the partial inflorescences are umbel-like with 3–11 flowers. The leaves are usually obovate, narrowly obovate or elliptic.

A few specimens with connate ovaries have been collected in a small area near the northern limit of the range of the species. They do not differ in any other character and I have here given them varietal rank.

5. Caelospermum balansanum Baill. – Fig. 13.

Caelospermum balansanum Baillon (1879d) 236, sub nom. *'Coelospermum balansaeanum'*; Guillaumin (1911) 168; Guillaumin (1959) 151. — T y p e: *Balansa 2773,* New Caledonia, Ferme modèle, 600 m, Feb. 1870 (P, lecto, selected here; K, P).

Stylocorina corymbosa Labillardière (1825) 48, t. 48. — *Olostyla corymbosa* (Labill.) Candolle (1830) 440; Don (1834) 540; Schlechter (1906) 265. — *Caelospermum corymbosum* (Labill.) Baill. ex K. Schumann (1891) 136; Guillaumin (1911) 168; Guillaumin (1929) 40; Guillaumin (1944) 12, 45, *nom. illeg.*; non *Caelospermum corymbosum* Blume ex Candolle (1830) 468. — *Caelospermum billardieri* Däniker (1933) 461; Guillaumin (1959) 151. — T y p e: *Labillardière s.n.*, New Caledonia, Balade (?), 1791–1795 (FI, holo; P).

Merismostigma neocaledonicum Moore (1921) 333, pl. 20. — T y p e: *Compton 1482,* New Caledonia, Ignambi, 700 m, 29 July 1914 (BM, holo).

Liana, up to c. 20 m. Stipules 1.3–3.8 mm long. *Leaves* 2 at each node; petiole 5–38 mm long; lamina 2.2–17 × 1.3–10 cm, narrowly to broadly obovate or elliptic to broadly elliptic, usually coriaceous, often chartaceous, dark green on adaxial side, paler green on abaxial side; base usually narrowly cuneate, sometimes broadly cuneate; margin not reflexed; apex acute or acuminate with acumen up to 5 mm long; pairs of secondary veins (4–)5–8(–9); domatia present in axils of secondary veins; cuticle not striate. *Inflorescence* usually a panicle, sometimes a corymb, (2–)5–14 cm long, with c. 20–80 flowers; partial inflorescences 4–15, usually umbel-like, each with 1–13 flowers; nodes of branches swollen; lowermost inflorescence branches (1–)1.7–5.5 cm long; branches opposite; pedicels usually simple, rarely partially connate, (0–)2–10 mm long and 1.1–1.3 mm in diam. in flower, up to 16 mm long

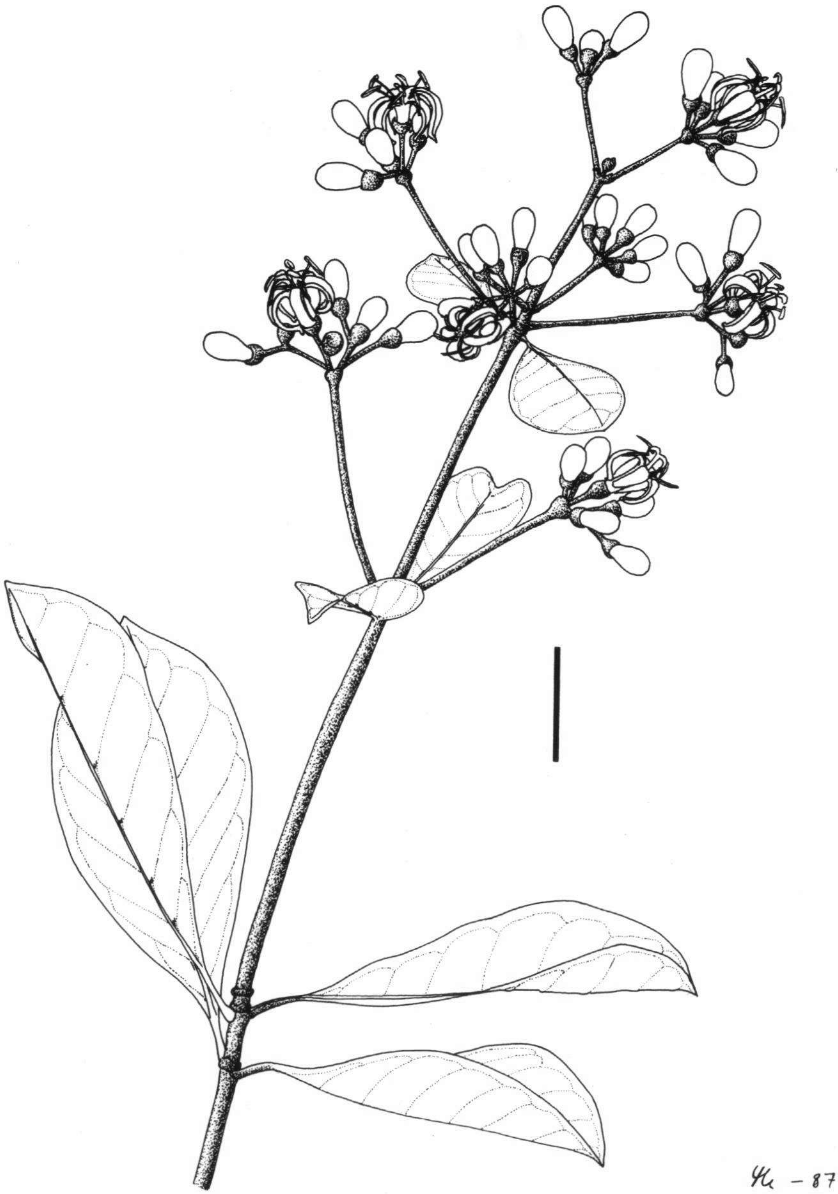


Fig. 13. *Caelospermum balansanum* Baill. Inflorescence; scale 20 mm (*Johansson 121*).

and up to at least 3.2 mm in diam. in fruit; calyx tube 0.7–1.8 mm long, 2.7–3.8 mm in diam.; colleters abundant along base of adaxial side; calyx teeth up to 0.3 mm long; corolla tube 3.5–7 mm long, 2.7–3.7 mm in diam.; corolla lobes 10–15 mm long, 2.6–3.2 mm wide; filaments 4.8–7 mm long; anthers 5–7.5 mm long; pollen grains: P = 34–51 µm; E = 41–58 µm; ovaries simple; style 6.5–9 mm long; stigma 5.5–8.5 mm long. *Fruit* a drupe, 12–16 × 11–16 mm, globose to obovoid, yellow.

Distribution. New Caledonia. Fig. 7.

Ecology. Virgin and secondary forest, forest margins, roadsides, on gneiss, schist, micaschist, greywacke and granodiorite, at altitudes of 20–1500 m. Flowering the whole year.

Notes. *Caelospermum balansanum* somewhat resembles *C. paniculatum,* the inflorescence usually being a multiflorous panicle and the leaves having domatia. In *C. balansanum* the corolla lobes and anthers are larger and the leaves usually broader. *Caelospermum truncatum* also resembles *C. balansaeanum,* although the latter is easily distinguished on the conspicuous swollen nodes and the regular opposite branching of the inflorescence.

When Candolle (1830) described the monotypic *Olostyla,* he simultaneously transferred *Stylocorina corymbosa* Labillardière to this new genus. Schumann (1891) later recombined *Olostyla corymbosa* under *Caelospermum corymbosum,* overlooking the fact that this name had been used for another species that had already been described by Candolle (1830). Däniker (1933) published *C. billardieri* as a new legitimate name for *C. corymbosum* (Labill.) K. Schum. The types of *Caelospermum balansanum* and *C. billardieri* are so similar that a separation into two species is unwarranted. The same applies to *Merismostigma neocaledonicum* S. Moore, the type of which falls within the range of variation of *Caelospermum balansanum.*

6. Caelospermum monticolum Baill. ex Guillaumin – Fig. 14.

Caelospermum monticolum Baill. ex Guillaumin (1929) 41; Guillaumin (1911) 168, *nom. nudum*; Däniker (1933) 462. — Type: *Balansa 3220,* New Caledonia, Mt Poume, 400 m, May 1871 (P, lecto, selected here).

Liana, sometimes a shrub, up to 5 m. Stipules 0.5–2.6 mm long. *Leaves* 2 or sometimes 3 at each node; petiole 5–23 mm long; lamina 3.2–11 × 1.4–4.5 cm, usually obovate or elliptic, sometimes broadly obovate or broadly elliptic, rarely ovate or narrowly elliptic, variously coriaceous, dark green on adaxial side, paler green on abaxial side; base narrowly cuneate; margin slightly or not reflexed; apex usually acute, sometimes acuminate with acumen up to 2 mm long, or obtuse and rounded; pairs of secondary veins (4–)5–8; domatia usually lacking, rarely present in axils of secondary veins; cuticle not striate. *Inflorescence* a corymb or a short panicle, 1–3.5 cm long, with 5–21 flowers; partial inflorescences 1–6, dichasia, each with 1–7 flowers; nodes of branches swollen; lowermost inflorescence branches 0.7–2.5 cm long; branches opposite; pedicels simple, 1.5–19 mm long and 0.8–1.2 mm in diam. in flower, up to at least 1.3 mm in diam. in fruit; calyx tube 2.4–6.5 mm long, 3.5–5.5 mm in diam., usually with 2–6 lobes less than 0.5–3.5 mm long; colleters lacking on inside of calyx tube; calyx teeth up to 0.2(–0.3)

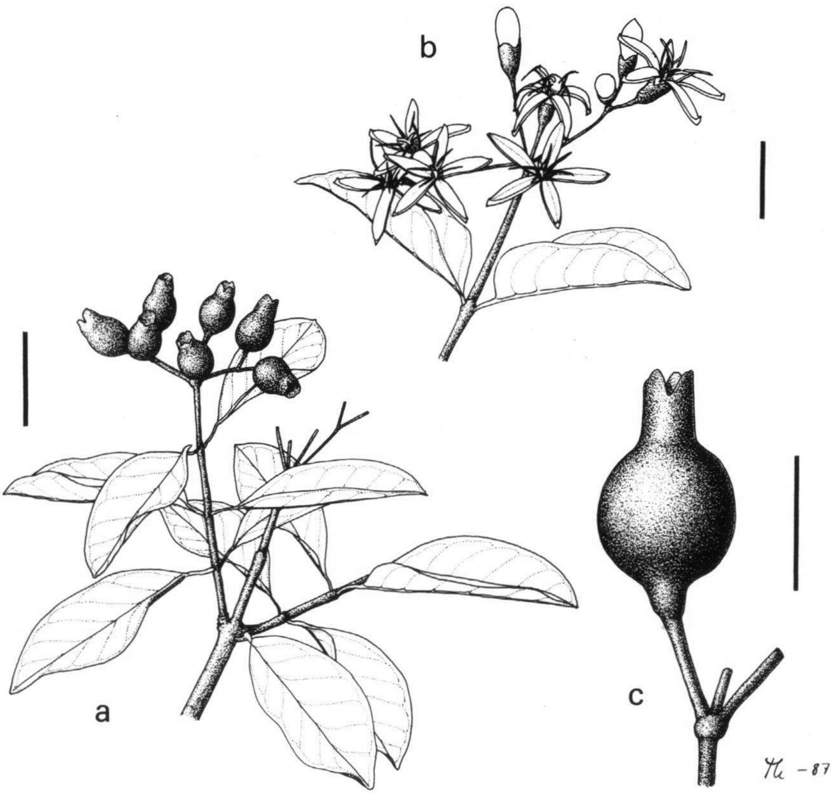


Fig. 14. *Caelospermum monticolum* Baill. ex Guillaumin. – a. Fruiting branch; scale 20 mm (*Johansson 90*); b. inflorescence; scale 20 mm (*Johansson 58*); c. fruit; scale 10 mm (*McPherson 6190*).

mm long; corolla tube 3.5–6.5 mm long, 2.5–2.7 mm in diam.; corolla lobes 10–15 mm long, 3.4–4.2 mm wide; filaments 3.3–7 mm long; anthers 5.5–7.5 mm long; pollen grains: P = 37–44 µm; E = 44–51 µm; ovaries simple; style (2.8–)4–11 mm long; stigma 3.7–6.5 mm long. *Fruit* a drupe, 10–12 × 8–9 mm in diam., elliptic, dark brown to brownish-purple.

Distribution. NW. New Caledonia. Fig. 8.

Ecology. Virgin and secondary forest and maquis, scrubland, sometimes roadsides; restricted to ultrabasic soils, often on stony or rocky ground, at altitudes of 20–900 m. Flowering the whole year.

Notes. *Caelospermum monticolum* is distinguished on the large calyx that lacks colleters on the inside. As in *C. crassifolium* the leaves are coriaceous and thick and they often lack domatia.

I have treated *C. monticolum* as the oldest legitimate name of this species, although there is possibly an older name, viz. *Figuierea fragrans*. This was earlier

described by Montrouzier (1860) on material from Ile Art as a scandent shrub with opposite coriaceous acuminate leaves, a large white corolla with five stamens inserted in the hairy throat and a 4-locular ovary, the locules being 1-ovular. Montrouzier placed the new genus near *Caelospermum*. The only species of *Caelospermum* known from Île Art is *C. monticolum* which is thus possibly conspecific with *Figuierea fragrans*. Most of Montrouzier's herbarium, which probably included the original collections from Île Art, was preserved at the Faculty of Medicine in Lyon and has been destroyed (Dr. P. Berthet, in litt.).

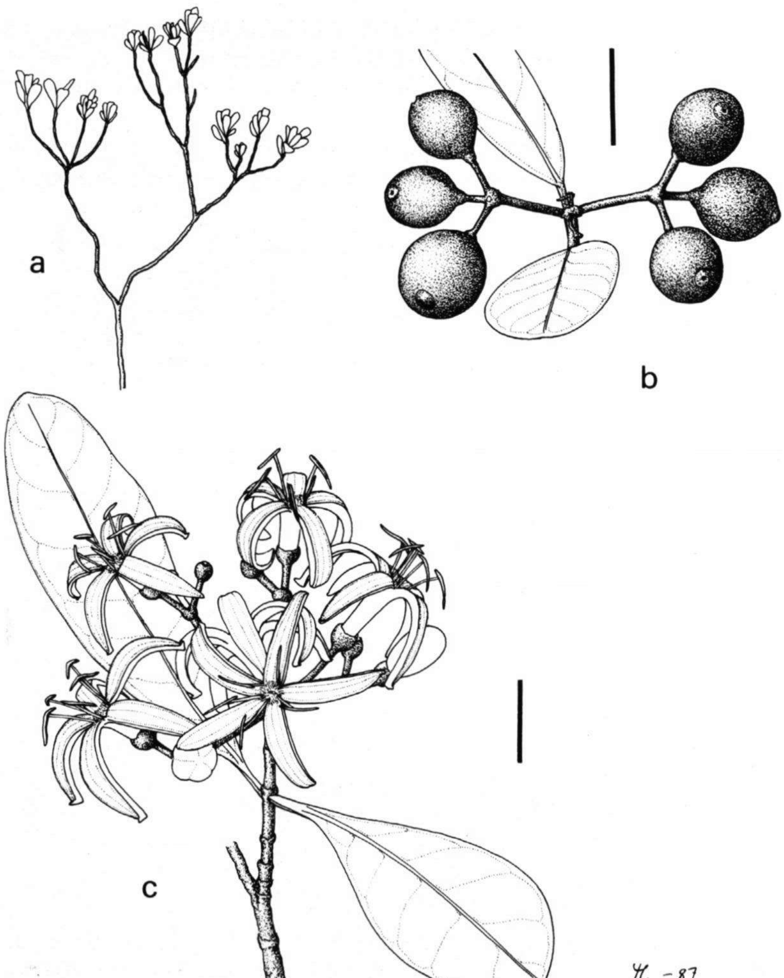


Fig. 15. *Caelospermum crassifolium* J.T. Johansson. – a. Habit; b. fruiting branch; scale 20 mm (*Johansson 85*); c. inflorescence; scale 10 mm (*Johansson 107*).

7. Caelospermum crassifolium J.T. Johansson – Fig. 15.

Caelospermum crassifolium J.T. Johansson (1987b) 321. — T y p e: *Johansson 107*, New Caledonia, Pic du Pin, 400 m, 30 Dec. 1983 (S, holo; MO, P).

Usually a shrub up to 3 m, sometimes a liana up to 7 m. Stipules 1.3–4.1 mm long. *Leaves* 2 at each node; petiole 3–31 mm long; lamina 2.3–15 × 1–7 cm, usually oblong or obovate or elliptic, sometimes narrowly oblong or narrowly or broadly obovate or broadly elliptic, coriaceous and thick, green or yellowish-green on adaxial side, paler green to glaucous on abaxial side; base narrowly cuneate; margin reflexed; apex usually obtuse and rounded or broadly acute, sometimes retuse or emarginate or acuminate with acumen up to 3 mm long; pairs of secondary veins (4–)5–9(–10); venation yellowish-green to yellow; domatia lacking; cuticle striate. *Inflorescence* a corymb or a short panicle, 1–4 cm long, with 5–20 flowers (the latter rarely single in an axillary reduced cyme); partial inflorescences 3–7, dichasia, each with 1–4 flowers; nodes of branches swollen; lowermost inflorescence branches 0.6–2 cm long; branches opposite; pedicels usually simple, rarely partially connate, (0–)0.5–9 mm long and 0.9–1.3 mm in diam. in flower, up to 11 mm long and up to at least 2 mm in diam. in fruit; calyx tube 0.8–1.9 mm long, 2.4–3.2 mm in diam.; colleters abundant along base of adaxial side; calyx teeth up to 0.3 mm long; corolla tube 3–7 mm long, 2.2–2.9 mm in diam.; corolla lobes 10–16 mm long, 2.3–4.1 mm wide; filaments 3.4–8 mm long; anthers 5–8 mm long; pollen grains: P = 39–46 μm; E = 44–60 μm; ovaries simple; style 7.5–11 mm long; stigma 3.3–6 mm long. *Fruit* a drupe, 15–18 × 13–15 mm, globose to obovoid, yellow.

D i s t r i b u t i o n. S. New Caledonia. Fig. 8.

E c o l o g y. Virgin and secondary forest and maquis, forest margins, roadsides, along small streams and ditches, and different types of open vegetation; restricted to ultrabasic soils, often on stony or rocky, more or less damp ground, at altitudes of 30–1000 m. Flowering the whole year.

N o t e s. Unlike the other species of *Caelospermum*, *C. crassifolium* is usually a shrub, although it sometimes develops into a liana (e.g., *Baumann-Bodenheim 15230, Guillaumin & Baumann-Bodenheim 10996, 11030* and *11550, Hürlimann 3416, Johansson 119, MacKee 2616, McPherson 3640*). It resembles *C. monticolum* in the few-flowered inflorescence which is usually a corymb. However, the calyx is smaller with colleters on the inside. The tissue of the leaf is usually thick and stiff, the upper side being yellowish-green, the lower side often glaucous. The cuticle of both sides is densely striate, a character that appears to be unique in the genus.

DUBIOUS NAMES

Caelospermum ahernianum Elmer (1906) 3.

I have not been able to trace the type of this species. The original specimen was presumably kept at the herbarium in Manila, and was probably destroyed during World War II. Several of the characters stated by Elmer (1906) indicate that the species does not belong to *Caelospermum*, for example the statements that the branchlets are flattened, the inflorescence is glabrous and ebracteate, the calyx glabrous, the corolla including the lobes 6 mm long and the anthers are basifixed.

Caelospermum fragrans (Montrouz.) Baill. ex Guillaumin (1911) 168; Guillaumin (1929) 41. — *Figuierea fragrans* Montrouzier (1860) 220.
See note under *C. monticolum.*

Caelospermum nigrescens (K. Krause) Guillaumin (1929) 41. — *Olostyla nigrescens* K. Krause in Schlechter (1908) 39; Guillaumin (1911) 167.
The type specimen of *Olostyla nigrescens* is probably not extant, since it was presumably preserved at B. *Olostyla nigrescens* is probably conspecific with either *Caelospermum balansanum* or *C. crassifolium,* but there are not sufficient diagnostic characters given in the description.

EXCLUDED TAXA

Caelospermum barbatum Spanoghe (1841) 318 = *Gynochthodes coriacea* Blume.

Caelospermum decipiens Baillon (1879c) 218 = *Morinda reticulata* Benth., non *Morinda reticulata* Gamble, nec *Morinda reticulata* Valeton.

Caelospermum gmelinii Ledeb. fide Miquel (1867) 62, pro syn., sphalm. = *Archangelica gmelinii* DC.

Caelospermum reticulatum (F. Muell.) Bentham (1867) 425 = *Pogonolobus reticulatus* F. Muell.
Pogonolobus described by Mueller (1858–1859: 55–56) is a monotypic genus occurring in eastern and northern Australia and Papua New Guinea. It is recognized on the following combination of characters: a shrub or small tree; branches terete; stipules triangular, apically bilobed, caducous, not sheathing the stem; domatia in axils of secondary veins; branches and leaves glabrous; inflorescence terminal, umbel-like, glabrous; pedicels terete, tuberculate; colleters absent from adaxial side of calyx tube; corolla white; adaxial side of corolla lobes flattened and covered with dense, long, spirally striate hairs; corolla tube covered with papillary hairs inside, hairs in upper part dense, long, spirally striate; stamens inserted in throat of corolla tube; reticulate sexine of pollen grains with small lumina; stigma bilobed; ovary bilocular; locules biovular; ovules inserted at or near middle of septum; drupe with four pyrenes, which are open by a basal slit; seeds flattened, with a basal wing.
Pogonolobus was included in *Caelospermum* by Bentham (1867) and subsequent authors, but differs from the latter genus in many important characters. It was recently re-established as a genus of its own (Johansson, 1987a).

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